

5 May 1983

MEMORANDUM FOR THE RECORD

SUBJECT: Potential Sources of Bias in the 1983 Ruble
Estimate of Soviet Defense Expenditures and
the Defense Burden

1. The CIA constructs a ruble estimate of Soviet defense costs in order to identify real trends in the resource commitment to these activities over time. We use a 1970 price base for our estimates because it is closely associated with the 1967 Price Reform when price relatives are closest to factor cost and returns to capital and profit margins between the civil and defense sectors of the economy are normalized. Moreover, the estimate is made in 1970 prices because of its compatibility with calculations of GNP derived from open Soviet statistics. This allows for the computation of the share of GNP devoted to the defense effort. [REDACTED]

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2. In conducting our periodic update of the estimate in 1982, we observed an apparent departure from the long-term trend of 4-5 percent annual growth for the period 1976-81 as a result of near-zero growth in the procurement of military hardware. The following discussion focuses on two possible sources of problems in our pricing approach which could lead to biases in our estimate of expenditure trends and the burden: problems in pricing related to the decline in factor productivity in the industrial sector during 1976-81 and problems related to the use of a 1970 price base rather than a more current price base. [REDACTED]

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The Productivity Problem

3. The first potential source of bias in our estimate of trends and the burden--and which pertains regardless of the price base used--relates to the observed slowdown in Soviet industrial performance that occurred in the latter half of the 1970s (Tenth Five Year Plan).¹ The slowdown in output of industrial products is to a large extent a consequence of absolute declines in factor productivity in the industrial sector or at least a decline in the past vigorous growth rate. For example, in 8 out of 10 sectors, factor productivity declined in real terms. In machine-building and metalworking (MBMW) and light industries, however, the rate of growth in factor productivity declined but remained positive. We believe that most of military hardware is produced in the MBMW sector. The significance of this will be discussed later. [REDACTED]

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4. We are concerned about the observed phenomenon in the industrial sector as a whole because of the implicit assumptions we make about the

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relationship of resource commitments (inputs) to military hardware production (outputs) over time. We assume, for example, that the resource content of observed changes in military outputs--our production estimates--does not depend on when the production occurs. This is an important assumption in that major changes in cost-of-production structures over time could lead to bias in observed trends. To the extent that it took a greater relative level of inputs in the latter half of the 1970s to achieve a given level of outputs, we would fail to capture both the trend (and level) of defense spending and the burden of defense on the economy. From the standpoint of factor productivity, one can argue either of two positions on the issue of inherent bias in the present estimates. []

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Real Declines in Defense Sector Productivity?

5. On the one hand, it can be argued that the defense sector, despite being accorded priority among resource claimants, has not remained insulated from the widespread shortages and disruptions in the economy at large. These interruptions in the otherwise smooth flow of inputs to the production process would necessarily cause an understatement of the real trend in resources committed to defense as our stable production functions failed to capture cost overruns in production programs. This type of cost overrun--one that is related directly to real resource increases--is different from the major cost overrun factors that plague US defense industries. Cost overruns in the US are generally associated with higher-than-anticipated inflation rates for labor and materials or the costs incurred by the manufacturer in the incorporation of new designs once series production has begun. [] ✓

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6. If one believes that defense production is not insulated completely, the crucial issue becomes to what degree is the procurement estimate biased downward? Is the defense sector likely to be affected more, less or about the same as civilian industry? Lacking any evidence of the impact of the economic environment of the last 7-8 years on the cost structure and therefore factor productivity trends of the defense sector, we can only speculate about how serious the problem might be. []

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7. There is probably good reason to assume that the decline in factor productivity experienced in the defense sector of industry is no greater than the declines in industry as a whole. For one, we know that defense receives priority in allocation, though in absolute terms perhaps receiving less than requested, making it less likely that the shortages and disruptions would be as severe as in the other industrial sectors. In addition, []

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[] the military representative system (Voyenpred) is a mitigating factor in dealing with chronic supply and quality control problems.² Finally, it is also possible

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that the defense sector, because of its relative importance, has access to significant reserves of materials in short supply at the plant or higher levels. Such reserves would act as a buffer to abnormal dislocations in the production process. Thus, if factor productivity has been degraded in weapons production, it seems probable that factor adjustments to our latest procurement series would be less than that for total MBMW productivity decreases. [redacted]

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8. Finally, despite general problems in industry, it is not at all clear that the industrial sector where most military hardware is produced--the MBMW sector--is experiencing absolute declines in productivity. For example, the "Industrial Slowdown" referred to above notes that MBMW factor productivity growth has slowed, but remained positive in 1976-82. Since it was already argued above that the military machinery sector was likely to be less affected by economic problems than the civilian side, this suggests that productivity in military machinery production has been rising, not falling since the mid-1970s, albeit rising at a slower rate than in the past. Thus, it would be unlikely that our estimate of defense spending would be downward biased at all from a productivity standpoint. For this to occur, factor productivity would have to be declining in the military machinery sector of MBMW, which in turn would require civilian MBMW to register some real increases in factor productivity. Since the reverse is more likely to be the case, this argues that our estimates are actually upward biased by the factor productivity phenomenon. [redacted]

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9. It should be noted, however, that if our estimates are upward biased, one would have to adjust the procurement series in a uniform fashion by calculated factor productivity for the whole of the 1965-81 period, not just the 76-81 period. This is because we are most concerned with changes in longer-term growth trends, not just absolute levels of growth since 1976. Adjusting the procurement series by the gross measurements of factor productivity suggested in the "Industrial Slowdown" paper would lessen somewhat the sharp break in growth over the period in question. These adjustments, if applied in full, would not alter the basic judgment that growth rates in procurement since 1976 have slowed significantly compared to 1965-76. [redacted]

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10. The productivity calculations [redacted] used fixed factor weights derived for 1970. Another approach to the same problem uses production function analysis with variable factor weights. If simple production functions are estimated for the MBMW sector covering the periods 1965-75 and 1975-79, the projected MBMW growth for the 1975-79 period averages about one percentage point/year higher using the estimate for the earlier period than for the latter. This means that the level of factor productivity measured by statistically estimated production functions is lower in the late seventies, the reverse conclusion reached in the "Slowdown" paper. In the extreme case where impacts on civilian and military MBMW production are assumed equal, this calculation suggests a downward bias in procurement growth of about one percentage point/year and in total defense of [redacted]

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about one half percentage point since the mid-1970s. Under a more realistic assumption which allows for more insulation of defense production from the sources of productivity decline, these shifts in growth rates are roughly halved. In either case, the general trend portrayed by our present estimates seems unaffected. Taken together with the "Slowdown" results, however, this calculation simply serves to show how inconclusive the assessment of the impact of productivity must inevitably be. [REDACTED]

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Possible Increases in Weapon Manufacturing Productivity

11. Another perspective on possible sources of bias in the estimate concerns the levels of "static" and "dynamic" efficiency of the defense industrial sector. Static efficiency refers to improving productivity at a given level of technology while dynamic efficiency reflects technological advances. If, for example, either of these measures were improving significantly rather than declining in this sector, factor productivity could have improved over time, and even improved relative to industry as a whole. [REDACTED]

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12. Turning first to the case of "static efficiency," one can argue that the defense industries did not have to operate at peak efficiency up to the mid-1970s because resource availability was unconstrained. Perhaps faced with less resource availability in absolute terms since the mid-1970s, it is possible that productivity could be improved in order to meet planned output. If such a "cushion" of planned inefficiency did exist across-the-board, there would be no systemic reason why factor productivity in this sector could not be improved. [REDACTED]

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13. In the case of technical progress or "dynamic efficiency" in the absorption of new manufacturing technologies, it is possible that there have been real increases in factor productivity in the defense sector. We know for example, that much of the Western technology acquired legally or illegally is used in the production of military hardware. Moreover, one could assume that a good portion of indigenously produced advanced manufacturing machines are also allocated to the defense sector. A case in point would be the replacement of manually operated machine tools with numerically controlled machines and automated production processes. While it is possible that the Soviets may not be able to operate the more advanced equipment at peak efficiency, that equipment would probably be more efficient than the equipment it replaced. [REDACTED]

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Effect on the Burden Estimate

14. To the extent that there is a bias in the estimate of Soviet defense spending, it follows that our calculation of the burden would be affected. If defense production has been insulated from at least some of the factors leading to declining productivity in other industrial sectors, all other things being equal, then our calculation of the burden would be biased upward. This would occur because there would be a smaller increase over time in the military use of resources compared to the increase on the civilian

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side. On the other hand, if factor productivity declined faster in defense than in industry as a whole, the burden estimate would be biased downward as there would be a greater increase over time in the military use of resources than in the civilian use. Since the former case--some relative insulation of defense--is more likely, an upward bias of unknown magnitude is entirely possible in the burden estimate. [REDACTED]

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The Price Base Problem

15. There is a further concern with our estimates--one associated with our use of a constant price series centered around 1970 which could distort the estimates of the trend and burden. With respect to our estimate of the trend in spending, our use of a 1970 price base rather than a more current year could cause an overstatement of the growth rate for the entire period of our estimate. In economic theory this is referred to as the Engel-Gershenkron effect. This is because the price of a product whose outputs is increasing rapidly tends to decline relative to other prices.⁴ Thus, moving to a more recent price base is not likely to increase the rate of growth we currently estimate for Soviet defense expenditures. [REDACTED]

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16. Moving to a more recent price base could also alter our perception of the burden of defense. This would depend on the relative rates of price change between the defense and civilian industrial sectors. If prices in the defense sector have been rising faster than those in the civilian sector, moving to a more recent price base, all other things being equal, would result in an increased burden measurement. The converse would be true if civilian prices were rising faster than those for military hardware. We have little hard information to point us in one or the other direction on this point. [REDACTED]

17. The limited understanding we do have of pricing policies in Soviet industries suggests that, between major price reforms, military prices adjust better than civilian prices to shifts in resource costs. Hence, if costs generally rise, one would expect the burden measured in established prices to rise as well. This calculation is deceptive, however, because established prices are not an economically reliable basis for burden assessment. Factor cost prices, arrived at through an adjustment calculation, are required instead. [REDACTED]

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18. Prices imposed through the 1982 price reform should give an improved basis for burden assessment, since the structure of relative prices established through periodic reforms is usually a decent approximation to relative factor costs. There is little basis currently to argue that these

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prices will yield a higher burden estimate than either the 1970 constant
prices derived from the 1967 reform or current established prices unadjusted
for deviations from factor costs.

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